

# **Analysis of the Department of Energy's Proposed Cleanup Plan for the Peconic River at the Brookhaven National Laboratory Site**

**Steve Levy**  
Suffolk County Executive



**Brian L. Harper, M.D., M.P.H.**  
Commissioner

**Prepared by:**

**Suffolk County Department of Health Services**

**Division of Environmental Quality**  
**Vito Minei, P.E., Director**

**Bureau of Groundwater Resources**  
**Andrew Rapiejko**

**June 16, 2004**

**This report was prepared in conjunction with the Suffolk  
County Legislature's Community Oversight Committee**

## **Table of Contents**

<b>Executive Summary .....</b>	<b>i</b>
<b>I Introduction.....</b>	<b>1</b>
<b>II Subcommittee of Scientific Experts.....</b>	<b>3</b>
<b>III Determination of the Extent of Cleanup.....</b>	<b>6</b>
<b>IV Determination of Economically and Environmentally Viable Cleanup Alternatives.....</b>	<b>9</b>
<b>V Comparison of the February 2000 Proposed Peconic River Cleanup Plan and the May 2004 Proposed Peconic River Cleanup Plan.....</b>	<b>15</b>
<b>VI Conclusions .....</b>	<b>17</b>
<b>VII Recommendations .....</b>	<b>18</b>
<b>Appendix A – Suffolk County Legislative Resolutions</b>	
<b>Appendix B – Expert Panel Resumes and Reviews/Comments</b>	
<b>B-1 – Phytokinetics</b>	
<b>B-2 - United States Geological Survey</b>	
<b>B-3 – The Chazen Companies</b>	
<b>B-4 - Cornell Cooperative Extension</b>	
<b>B-5 – Radioactive Waste Management Associates</b>	
<b>B-6 – USDA Natural Resources Conservatin Service</b>	
<b>B-7 – Suffolk County Soil and Water Conservation District</b>	
<b>B-8 – U.S. Fish and Wildlife Service</b>	
<b>Appendix C– U. S. Department of Energy’s 2004 Proposed Remedial Action Plan For The Peconic River</b>	

## **EXECUTIVE SUMMARY**

In July 2000, the Suffolk County Legislature passed Resolution 615-2000 in response to concerns raised at a public hearing held by the Legislature regarding the U. S. Department of Energy's (DOE's) proposed Peconic River cleanup plan. This resolution authorized the Commissioner of the Suffolk County Department of Health Services (SCDHS) to establish a panel of experts to assist the SCDHS in analyzing the DOE plan, and to submit a report on the findings to the Suffolk County Legislature within six months. It also required that the SCDHS work with the Community Oversight Committee (COC) (previously established in Resolution 168-1999) in making the determinations included in the report. However, concurrent with the adoption of Resolution 615-2000, the DOE withdrew its cleanup plan and deferred a decision until further information could be evaluated. On May 24, 2004, the DOE released a new Peconic River cleanup plan for public comment. An analysis of this new Peconic River cleanup plan was performed in fulfillment of the provisions and intent of Suffolk County Resolution 615-2000.

The SCDHS Commissioner, in conjunction with the COC, established a nine-member expert panel with representatives from governmental agencies and private corporations. The expert panel members reviewed pertinent documents as they became available, and provided their written comments and/or reviews. The SCDHS and COC used this input to make determinations regarding the extent of cleanup necessary in the Peconic River, as well as the types of remediation alternatives that could be considered viable in the Peconic River.

Elevated human health and ecological risks have been identified for the consumption of fish from the Peconic River due to elevated concentrations of mercury (human and ecological) and PCBs (human). These contaminants have bioaccumulated in fish from sediments that have been contaminated by past discharges into the Peconic River from the Brookhaven National Laboratory sewage treatment plant. The SCDHS and COC determined that the extent of Peconic River cleanup needed is that which reduces, to the greatest extent possible, the potential human health and ecological risks caused by the sediment contamination. Remediating sediments located within depositional areas that contain the highest contaminant concentrations can accomplish this. In addition, areas identified as "hot spots", as well as areas that preferentially produce methylmercury, should also be remediated. The SCDHS and COC also determined that the most economically and environmentally viable cleanup alternative for the Peconic River is sediment removal using conventional construction equipment, followed by wetland restoration.

A comparison of the DOE cleanup plan for the Peconic River proposed in February of 2000, and the current plan (May 2004) was performed. The SCDHS and COC determined that, with respect to the extent of cleanup proposed, the May 2004 DOE cleanup for the Peconic River is a more thorough and appropriate cleanup compared to the February 2000 plan. The extent of cleanup currently proposed is approximately three times that of the 2000 proposal, and the cost approximately two times. It was also determined that the May 2004 preferred cleanup alternative (sediment removal by standard construction equipment followed by wetland restoration) is appropriate.

The following primary recommendations were made:

- The DOE should implement Alternative 4 in its present Peconic River Proposed Remedial Action Plan (i.e., remove the sediment layer down to sand from depositional areas and from areas identified as preferential methylmercury sources). A long-term monitoring program should be implemented to assure the mitigation strategies are effective.
- The DOE should consider the results of current methylmercury studies to assess the need to expand the cleanup areas proposed in Alternative 4 that are located east of Schultz Rd.
- Strict engineering controls should be implemented prior to excavation to ensure that contaminated sediments are not mobilized to downstream areas. Rigorous monitoring of the water column should be implemented to assess and ensure the success of these controls.

## **I – INTRODUCTION**

### **Background**

In February of 2000, the United States Department of Energy (DOE) released for public comment a Proposed Remedial Action Plan (PRAP) to address contaminated sediments in the Peconic River. This contamination resulted from past discharges of the Brookhaven National Laboratory's (BNL's) sewage treatment plant (STP), which is located at the headwaters of the Peconic River.<sup>1</sup> The DOE's preferred alternative called for the use of standard construction equipment to excavate sediments containing contaminant levels higher than the proposed cleanup goals (9.8 ppm mercury, 88.9 ppm silver, 310 ppm copper). Following excavation, the disturbed wetlands were to be restored.

Subsequent to the DOE's release of this PRAP, the Suffolk County Legislature held a public hearing regarding this cleanup plan. As a result of concerns expressed at this hearing, the Suffolk County Legislature adopted Resolution 615-2000 (Appendix A-1). This resolution authorized the Commissioner of the Suffolk County Department of Health Services (SCDHS) to analyze this plan and submit a report on the findings to the Suffolk County Legislature within six months. However, concurrent with the adoption of this resolution, the DOE withdrew its PRAP and deferred the cleanup of the Peconic River. This was done due to concerns raised during the public comment period by regulatory agencies and members of the public. On May 24, 2004, the DOE released a new Peconic River PRAP for public comment. This report will analyze DOE's new Peconic River cleanup plan in fulfillment of the provisions and intent of Suffolk County Resolution 615-2000.

### **Scope of Contamination in the Peconic River**

As demonstrated by monitoring conducted by BNL, it has been determined that past operations and practices have resulted in wastewater containing chemical and radiological contaminants being discharged at the BNL STP, which is located at the headwaters of the Peconic River. Contaminants of greatest concern include: metals (mercury, copper, silver, cadmium), PCBs, radionuclides (primarily Cesium<sup>137</sup> (Cs<sup>137</sup>)) and pesticides (DDE, DDD). These contaminants have deposited in the sediments of the Peconic River and act as a source of contamination, that is bioaccumulating in fish (particularly with respect to PCBs and mercury). Sediment analyses have determined that contaminated sediments have been transported more than five miles downriver.

Human health and ecological risk assessment studies have been performed by BNL (2003) and the SCDHS (2004). Both studies have identified a human health risk (for consumption of fish due to mercury and PCBs). These risks were specifically identified for developing babies, children (developmental) and adults (cancer, 1 in 10,000). The BNL and SCDHS ecological risk assessments also identified elevated risks to birds consuming fish from the Peconic River (increased reproductive failure). These risks were due to the elevated mercury concentrations identified in Peconic River fish.

BNL is currently on the United States Environmental Protection Agency's (EPA's) National Priorities List of Superfund Sites. The Peconic River has been designated Operable Unit V (OU V), one of seven Operable Units at this site. The DOE has proposed remediating the Peconic

---

<sup>1</sup> *Proposed Plan for Operable Unit V: Peconic River, Brookhaven National Laboratory, U.S. Department of Energy, May 2004.*

River sediments under the *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA), often called the “Federal Superfund Law”. This remediation is being conducted in accordance with this law and with the oversight of EPA, New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH) and the SCDHS.

### **Provisions of Resolution 615-2000**

Resolution 615-2000 requires that the Commissioner of the SCDHS analyze the DOE Peconic River cleanup plan, including the proposed cleanup standards. It also specifies that the Commissioner should determine economically and environmentally viable cleanup alternatives, and the extent of cleanup that is necessary. To assist the Commissioner in analyzing the cleanup plan, Resolution 615-2000 requires that the Commissioner establish a subcommittee of scientific experts possessing specific expertise (Table 1). Also, specific agencies are required to be represented on the panel (Table 2). However, the resolution states that the panel need not be limited to representatives solely from these agencies. The findings of this analysis are to then be presented in a report to the Suffolk County Legislature. The resolution also requires that the Commissioner work in conjunction with the Community Oversight Committee (COC) (Table 3) previously established by the Legislature by Resolution 168-1999 (Appendix A-2) on the provisions of this resolution.

**Table 1**

Types of Expertise Required  
to be Represented on Expert Panel

Membership of the Suffolk County

<b>Freshwater Limnology</b>
<b>Sedimentology</b>
<b>Freshwater Wetlands</b>
<b>Botany</b>
<b>Phytoremediation</b>

**Table 2**

Agencies Required  
to be Represented on Expert Panel

<b>Cornell Cooperative Extension</b>
<b>USDA Natural Resources Conservation Service</b>
<b>Suffolk County Soil &amp; Water Conservation District</b>
<b>United States Geological Survey</b>
<b>US Fish &amp; Wildlife Service</b>

**Table 3**  
Legislature's

Community Oversight Committee (COC)

<b><i>Community Alliance for Lab Accountability (CALA)</i></b>
<b><i>Citizens Campaign for the Environment (CCE)</i></b>
<b><i>Standing for Truth About Radiation (STAR)</i></b>
<b><i>Group for the South Fork</i></b>
<b><i>South Fork Breast Health Coalition</i></b>
<b><i>Peconic BayKeeper Program</i></b>
<b><i>Fish Unlimited</i></b>
<b><i>Affiliated Brookhaven Civic Organizations, Inc. (ABCO)</i></b>
<b><i>Longwood Alliance</i></b>

## II - SUBCOMMITTEE OF SCIENTIFIC EXPERTS

### Establishment of the Committee

In order to establish the subcommittee of scientific experts (herein referred to as “the expert panel”) required by Resolution 615-2000, the SCDHS and COC devised a list of twenty-three prospective expert panel members (Table 4). Each of these prospective members was sent a letter by the SCDHS inquiring as to their willingness to participate in this project. Nine people indicated that they were interested in participating on the expert panel. Five of these persons were representing agencies specifically required in Resolution 615-2000 (Table 4), and volunteered their time for this project. The remaining four persons represented private corporations, and thus required monetary reimbursement for their efforts. Since Resolution 615-2000 did not provide a source of funds, a funding source needed to be obtained.

Table 4

Sponsor	Contact Name	Organization	Disposition
SCDHS	Christopher Pickerell	Cornell Cooperative Extension*	Accepted
SCDHS	Allan Connell	USDA Natural Resources Conservation Service*	Accepted*
SCDHS	Thomas McMahon	Suffolk County Soil & Water Conservation Dist.*	Accepted
SCDHS	Christopher Schubert	United States Geological Survey*	Accepted
SCDHS	Charles Merckel	United States Fish & Wildlife Service*	Accepted
STAR	Marvin Resnikoff	Radioactive Waste Management	Accepted
STAR	Paul Mankiewicz	The Gaia Institute	Accepted
Fish Unlimited	Ari Ferro	Phytokinetics, Inc.	Accepted
CCE	Jeff Kane	Chazen Engineering & Land Surveying Co., P.C.	Accepted
Fish Unlimited	Jack Frost	EdenSpace Systems Corp.	Declined <sup>#</sup>
Fish Unlimited	Michael Carr	Living Technologies	Declined <sup>#</sup>
Fish Unlimited	Andrew McCusker	Gunderboom Mackworth Environ. Management	Declined <sup>#</sup>
Fish Unlimited	Paolo Monciar	Phytonet Electronic Newsgroup Network	Declined <sup>#</sup>
Fish Unlimited	Davis Del Porto	Ecological Engineering & Design	Declined <sup>#</sup>
Fish Unlimited	Charles McGuckin	Roux Associates	Declined <sup>#</sup>
STAR	Arjun Makhijan	Institute for Energy and Environmental Research	Declined
STAR	David Ehrenfeld	Cook College, Rutgers University	Declined <sup>#</sup>
STAR	John Boreman	Northeast Fisheries Science Center	Declined <sup>#</sup>
STAR	Steven Tettelbach	Marine Sciences, Southampton College	Declined <sup>#</sup>
STAR	John Todd	Ocean Arks International	Declined <sup>#</sup>
CCE	Jonathan Phinney	American Society of Limnology & Oceanography	Declined <sup>#</sup>
CCE	Karen Blumer		Declined <sup>#</sup>
SCDHS	Charles Guthrie	NYS Department of Environmental Conservation	Declined

\* Agency required by Res. No. 615-2000

\*\* Resignation letter received June 4, 2004

# No response received, declination inferred.

The SCDHS submitted a grant application to the U.S. Department of Energy in an attempt to obtain funds to reimburse the panel members representing private corporations. The SCDHS was unsuccessful in obtaining this grant. Brookhaven Science Associates (BSA) offered to provide the funds required for these panel members. An arrangement was agreed upon whereby BSA hired an intermediary (P. W. Grosser Consulting, Inc.) who contracted with the panel members that required monetary reimbursement. P.W. Grosser Consulting, Inc. was required by BSA to obtain the scope of work for these panel members from the SCDHS. This arrangement was agreeable to both the SCDHS and COC, and allowed these private corporations to participate on the expert panel.

Upon securing a source of funds, the SCDHS and COC reviewed the qualifications of the prospective expert panel members interested in participating in this project. The SCDHS and COC determined that the nine prospective expert panel members would bring a diverse range of expertise to the panel, and that the areas of expertise required by Resolution 615-2000 (Table 1) would be met. These nine prospective panel members were then appointed to serve on this panel by the Commissioner.

### **Expert Panel Review Process**

Considering the vast number of reports produced studying the Peconic River contamination, and the range of complex issues associated with this project, the SCDHS and COC developed a strategy for employing the expert panel in the most efficient way practicable. This strategy was developed through careful review of each panel member's expertise, the documents available and appropriate for review, and the overall goals of the project at hand. Table 5 illustrates this strategy by indicating the particular documents individual panel members were sent, and the ones for which written reviews/comments were received (Appendix B).

Table 5 also indicates the five panel members that represent the agencies requiring representation by Resolution 615-2000 (Table 2). The individuals representing these agencies provided their services to this project as a courtesy, and were each provided with all the documents pertinent to this project. Since these individuals possess very specific expertise on certain aspects of this project, the particular documents on which they provided written reviews/comments on was left to their discretion<sup>2</sup>. The other four panel members were required to review/comment on particular documents as decided by the SCDHS and COC, and as required contractually through P.W. Grosser Consulting, Inc. (as described above)<sup>3</sup>.

---

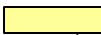
<sup>2</sup> USDA and Suffolk County Soil & Water Conservation District did not submit any written reviews/comments.

<sup>3</sup> Although *The Giaia Institute* (Paul Mankiewicz) executed a contract with P.W. Grosser Consulting, Inc. to provide written reviews/comments on all the documents provided to them, written reviews/comments were never submitted.



Table 5

Expert Panel Members	Phytoremediation <sup>4</sup>	Sediment Excavation/Restoration <sup>5</sup>	Vacuum Guzzler <sup>6</sup>	Risk Analysis <sup>7</sup>	Peconic River Water Level Study <sup>8</sup>	Habitat Assessment and Fish Biomass Prediction Study <sup>9</sup>	2003 Methylmercury Data Report <sup>10</sup>	Proposed Cleanup Plan <sup>11</sup>
Christopher Pickerell Cornell Cooperative Extension								
Allan Connell USDA NRCS								
Thomas McMahon Suffolk County SWCD								
Christopher Schubert United States Geological Survey								
Charles Merckel USFWS								
Marvin Resnikoff Radioactive Waste Management								
Paul Mankiewicz The Gaia Institute								
Ari Ferro Phytokinetics, Inc.								
Jeff Kane Chazen Engineering								

 Voluntary Agency  
Panel Member

 Contracted  
Panel Member

 Report not sent

 Report sent,  
no comments received.

 Report sent,  
comments received

<sup>4</sup> *Determination of Phytoextraction and Harvesting Efficiency of Several Dominant Emergent Wetland Plants – Contaminated Sediment in the Peconic River*, Brookhaven National Laboratory, January 17, 2003.

<sup>5</sup> *Completion Report, Operable Unit V, Sediment Removal and Wetland Restoration Pilot Study*, Brookhaven National Laboratory, December 31, 2002.

<sup>6</sup> *Completion Report, Operable Unit V Peconic River, Sediment Removal High Capacity Vacuum/Guzzler Recovery Pilot Study*, December 11, 2002

<sup>7</sup> *Baseline Human Health Risk Assessment, Operable Unit V, Peconic River*, Brookhaven National Laboratory, March 10, 2003

<sup>8</sup> *Estimation of Potential Water Levels in the Peconic River near Brookhaven National Laboratory Based on a Review of Hydrologic Data*, Sullivan, T., April 15, 2003

<sup>9</sup> *Peconic River Habitat Assessment and Fish Biomass Prediction*, Meixler, M., Bain, M., April 15, 2003

<sup>10</sup> *Peconic River 2003 Data Summary Report*, Quantitative Environmental Analysis, LLC, April 6, 2004

<sup>11</sup> *Proposed Plan for Operable Unit V: Peconic River*, Brookhaven National Laboratory, U.S. Department of Energy, May 24, 2004

### III – Determination of the Extent of Cleanup

Resolution 615-2000 requires the SCDHS and COC to determine the extent of cleanup that is necessary in the Peconic River. This section will first discuss the extent of PCB and mercury contamination identified in the Peconic River. These contaminants have been identified as posing the primary human and ecological risks in the environment.<sup>12</sup> Following this discussion, the SCDHS and COC determination on the extent of cleanup necessary in the Peconic River is presented.

#### PCB Contamination

The extent of sediments contaminated with PCBs is primarily limited to the portion of the Peconic River located on the BNL property (“on-site”). Likewise, fish exhibiting elevated concentrations of PCBs were also primarily limited to the on-site portion of the river. The most prevalent PCB congener detected was aroclor-1254 (132 detections), with a maximum concentration of 1.5 parts per million (ppm), and an average concentration of 0.16 ppm. The samples exhibiting the highest concentrations of PCBs are located within sediment depositional areas identified on-site. These samples also exhibit elevated concentrations of some of the other contaminants of concern, indicating co-location (Table 6).

Table 6

Sample Location	Aroclor –1254 ppm	Mercury ppm	Copper ppm	Silver ppm	Cs137 pCi/g
PR-D30	0.0069	1	90	18.7	2.46
PR-A15	0.0135	0.065	5.48	1.45	0.15
PR-09	1.3	16.7	714	116	4.17
PR-10	1.5	24.5	156	156	6.31

#### Mercury Contamination

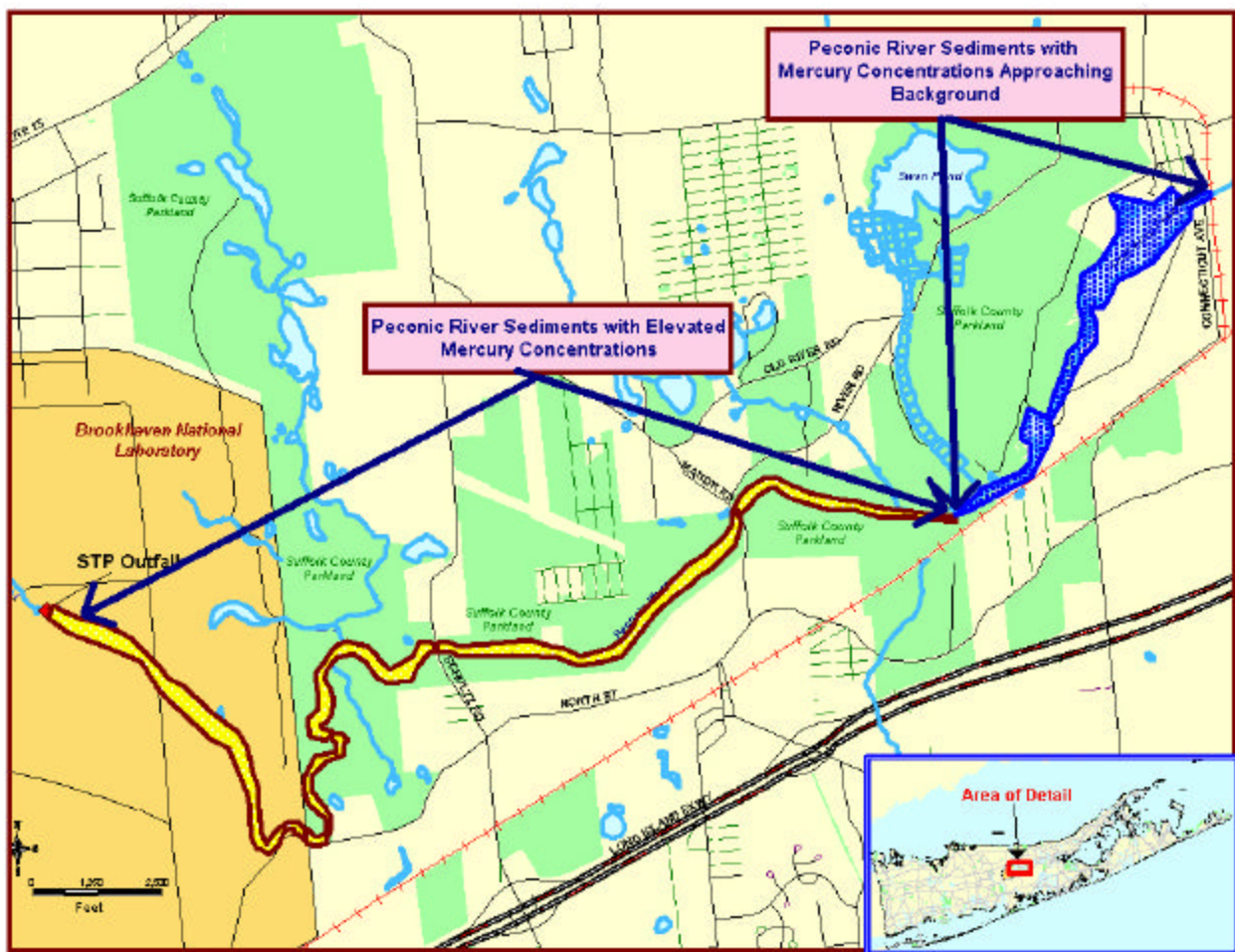
The extent of Peconic River sediments contaminated with mercury concentrations above background levels has been identified as far as five miles downstream from the BNL STP (Figure 1). Beginning at the BNL eastern property boundary, the Peconic River flows off-site through Suffolk County Parkland. All of the off-site mercury contamination is located in this Suffolk County parkland. In general, the concentrations are higher on-site, and decrease with distance downstream. The highest mercury concentrations have been observed in the depositional areas of the river. These areas are identified by substantial bends in the river that cause the water flow to slow down, allowing particulates in the water to settle out into the sediments.

The highest levels of mercury recorded in Peconic River fish were observed in the most recent on-site collection (2000). There were four fish collected and analyzed during this sampling

---

<sup>12</sup> *Baseline Human Health Risk Assessment*, Brookhaven National Laboratory, March 2003 and *Health and Environmental Assessment of the Peconic River*, Suffolk County Department of Health Services, May 2004.

Figure 1  
Extent of Elevated Mercury Concentrations in the Peconic River



event. The concentrations in these fish ranged from 0.96 ppm to 3.72 ppm (average concentration of 2.24 ppm).

In the summer of 2001, fish were collected from three off-site locations in the Suffolk County parkland, adjacent to the BNL site (up to Schultz Road). Concentrations observed in these fish were not as high as those observed in the 2000 on-site samples (range 0.2 to 1.33 ppm, average 0.6 ppm). The highest mercury concentration observed during this sampling event (1.33 ppm) was from a fish collected at the furthest downstream sampling site located at Schultz Road (approximately 1.5 miles downstream from the BNL site boundary). Downstream of Schultz Road, there is not a substantial dataset with respect to mercury concentrations in fish (the most recent sampling was conducted in 1997). Average fish concentrations, in general, decrease with distance from the BNL STP. However, there are many mitigating factors (e.g., limited number of samples, fish size, fish species, etc.) that do not allow for a statically valid trend analysis to be performed.

### Methylmercury

Sediments contaminated with mercury act as a source of contamination to fish. However, the pathway of mercury from sediment to fish tissue is not direct, and is very complex. In order for fish to accumulate mercury, the mercury in the sediments must be converted to an organic form of mercury called methylmercury. This methylation of mercury (i.e., conversion of mercury to methylmercury) is a biological process that has many complex regulating factors. Methylmercury is a toxic form of mercury that is readily accumulated by biota.

Four rounds of water column methylmercury samples were collected from the Peconic River in 2003 (April, June, August and November). The April, June and August sampling rounds consisted of samples collected from the BNL STP to Schultz Road, while the November round included samples from the STP to Connecticut Avenue. These data indicated that sediments between the BNL property boundary and Schultz Road appear to be a significant source of methylmercury to the river, as the mass of methylmercury and proportion of methylmercury to total mercury in the water column for this segment of the river are consistently higher than those on the BNL property<sup>13</sup>. Due to seasonal and long-term variations in climate, hydrology, vegetative factors and water quality that control mercury cycling, no conclusive assessment on the methylation propensity of the sediments downstream of Schultz Road can be made at this time, since only one round of data (collected in November) has been reported to date<sup>14</sup>. BNL is currently in the process of collecting and analyzing additional methylmercury samples in these downstream areas (as well as the upstream areas previously done) so an appropriate assessment can be made.

### **Extent of Peconic River Cleanup Necessary – SCDHS/COC Determination**

The SCDHS and COC have determined that the extent of cleanup necessary in the Peconic River is that which reduces, to the greatest extent possible, the identified potential human health and ecological risks caused by the contamination. The health and environmental assessments performed by BNL (2003) and SCDHS (2004) identified the consumption of fish contaminated with PCBs and mercury as causing the greatest increase in risk (for humans and wildlife). Therefore, the basic method employed by the SCDHS and COC to determine the extent of cleanup necessary in the Peconic River was to use the reduction of PCB and mercury concentrations in fish as a primary goal. The removal of elevated concentrations of other contaminants of concern (e.g. copper, silver and Cs<sup>137</sup>) from the system, although not specifically identified as significantly elevating risks, has also been considered in this determination.

Having reviewed the information regarding the extent of contamination in the Peconic River sediments, and considering the opinions provided by the panel of experts established by the Commissioner (Appendix B), the SCDHS has made the following specific determinations regarding the extent of cleanup on and off of BNL property:

### **Extent of Cleanup On-site**

All of the depositional areas located on the BNL property should be remediated. These areas have consistently exhibited the highest contaminant concentrations for all contaminants of

---

<sup>13</sup> *Peconic River 2003 Data Summary Report*, Quantitative Environmental Analysis, April, 2004, pp ES-2.

<sup>14</sup> USGS correspondence Schubert to Rapiejko, *Suffolk County Department of Health Services (SCDHS) Peconic River Project – Expert Panel*, June 9, 2004, p. 2, (Appendix B-2)

concern. Localized “hot spots” that have been identified outside these depositional areas should also be included in the cleanup, as well as any identified methylation areas not located within the depositional areas. This will afford the greatest level of confidence that the cleanup action on-site will result in a decrease in PCB and mercury concentration in the fish located on-site, as well as the reduction of the other identified contaminants in the sediments (e.g. copper, silver, Cs<sup>137</sup>, etc.).

#### ***Extent of Cleanup Off-site to Schultz Road***

The identified depositional areas off-site, between the BNL boundary and Shultz Road, have consistently exhibited the highest contaminant concentrations identified off-site. These depositional areas should be remediated. In addition, non-depositional areas between the BNL property boundary and Schultz Road that have been identified as significant methylation areas also need to be remediated. These sediments may have mercury concentrations that are low relative to those identified in the depositional areas, but their contribution to increased mercury levels in fish could be very significant.

#### ***Extent of Cleanup Off-site to Schultz Road***

Samples collected in a depositional area located in the vicinity of Manor Road (5 miles downstream of the BNL STP) in the late summer of 2003 were identified as containing elevated concentrations of mercury (maximum concentration 7 ppm). The extent to which these contaminated sediments are contributing methylmercury to the Peconic River system has not as yet been determined. Samples are currently being collected and analyzed to assist in this determination. However, due to the uncertainties and complicating factors that regulate methylation in a river system, the SCDHS feels that the highest concentrations of mercury identified in these sediments warrant remediation, regardless of the outcome of the methylmercury analyses. The results of the current sampling effort should be used to determine if additional areas, located outside the identified hot spots, need to be remediated. Additionally, BNL should review and consider the specific recommendations made by the United States Geologic Survey (USGS) for this report regarding methylmercury sample collection procedures.<sup>15</sup> These recommendations could be incorporated into the methylmercury sampling plans for long-term monitoring.

### **IV–Determination of Economically and Environmentally Viable Cleanup Alternatives**

Resolution 615-2000 requires that the SCDHS and COC determine economically and environmentally viable cleanup alternatives for the Peconic River. This section will initially discuss the efforts made by the DOE in gathering information on viable, cost-effective cleanup alternatives for the Peconic River. This DOE initiative was commenced subsequent to deferring the Peconic River cleanup decision in July 2000. Following this discussion, the SCDHS and COC determination on economically and environmentally viable Peconic River cleanup alternatives is presented.

#### **Peconic River Remedial Alternatives Workshop**

On December 12 – 13, 2000, DOE and BNL hosted a Peconic River Remedial Alternatives Workshop. The purpose of this workshop was to evaluate alternative remedial technologies and

---

<sup>15</sup> USGS correspondence Schubert to Rapiejko, *Suffolk County Department of Health Services (SCDHS) Peconic River Project – Expert Panel*, June 9, 2004, p. 2, (Appendix B-2)



strategies for the removal or treatment of contaminated sediments in the Peconic River.<sup>16</sup> DOE conducted a nationwide search and contacted eighty-six firms regarding their interest in participating in this workshop. Sixteen firms presented at the workshop, and others participated in poster sessions. The workshop was open to members of the public.

### **Analysis of Potential Technologies**

The information obtained from the workshop was used by the DOE and BNL (with input from the public) to select particular cleanup technologies that had potential for implementation in the Peconic River. Four technologies were selected: Phytoextraction; Electrochemical Remediation; High Capacity Vacuum/Guzzler Recovery; Sediment Removal/Wetland Restoration. BNL then initiated a detailed evaluation for each of these technologies with respect to their economic and environmental viability. The technology's ability to minimize environmental disruption and achieve the desired level of cleanup was emphasized in this evaluation.

#### ***Phytoextraction***

Phytoextraction is a technology that employs the use of plants to remove contaminants from impacted soils. This is accomplished by first allowing plants to uptake contaminants via their roots, and then harvesting and disposing of these plants by conventional means. This cycle of growing and harvesting plants is repeated until contaminant levels are reduced to the desired levels.

BNL evaluated this technology by collecting native plants in the Peconic River located in areas of highest sediment contamination. The ability of these plants to uptake the contaminants of concern was evaluated.<sup>17</sup> In addition, testing was performed to assess the bioavailability of these contaminants in the sediment. The results of these analyses indicated that the timeframe for removal of contaminants from the Peconic River by using phytoextraction was on the order of hundreds to thousands of years—depending on the types of plants used, the particular contaminant, and the desired cleanup goal. Based on these results, the DOE determined that phytoextraction was not a viable remediation alternative for the Peconic River cleanup project.

#### ***Electrochemical Remediation***

Electrochemical remediation is an alternative technology that uses an electric current in the treatment process to either mobilize or break down contaminants in soils or sediments.<sup>18</sup> Inorganic contaminants, such as mercury, silver and copper, migrate to electrodes that are placed in the river, where they are accumulated and removed. In the case of organic compounds, such as PCBs and pesticides, the electrochemical reactions break up the contaminants into their basic components of carbon dioxide and water.

Further evaluation revealed uncertainties concerning the effectiveness of this technology in removing the contaminants of concern from the Peconic River. Specifically, this technology did not demonstrate the ability to remove Cs<sup>137</sup> from the sediment, and concerns existed that the

---

<sup>16</sup> *Peconic River Remedial Alternatives Workshop Proceedings, December 12-13, 2000*, USDOE

<sup>17</sup> *Determination of Phytoextraction and Harvesting Efficiency of Several Dominant Emergent Wetland Plants – Contaminated Sediment in the Peconic River*, Brookhaven National Laboratory, January 17, 2003.

<sup>18</sup> *Electrochemical Remediation, Peconic River Remedial Alternatives, Technology Fact Sheet*, Brookhaven National Laboratory. undated.

Cs<sup>137</sup> may become mobilized, possibly creating an additional environmental consequence. Based upon this information, the DOE determined that electrochemical remediation was not a viable remediation alternative for the Peconic River cleanup project.

### ***High Capacity Vacuum/Guzzler Recovery***

The high capacity vacuum/guzzler technology uses high-velocity air movement to selectively remove contaminated sediments, thereby reducing the disturbance to the surrounding environment.<sup>19</sup> Contaminated sediment is removed through the suction end of a hose that conveys the sediment to the vacuum/guzzler unit located adjacent to the wetland. Disturbance to the wetlands is reduced due to the lack of large construction vehicles required in the wetlands for implementation of this technology.

Based upon the information obtained through further evaluation, the DOE determined that the high capacity vacuum/guzzler technology could be a viable remediation alternative for the Peconic River cleanup project. DOE authorized BNL to perform a pilot study in order to further evaluate this technology's viability as a Peconic River cleanup alternative.

### ***Pilot Study - High Capacity Vacuum/Guzzler Recovery***

BNL conducted a pilot study to determine the feasibility of deploying high capacity vacuum/guzzler technology within densely vegetated areas of the Peconic River while minimizing disturbance to surrounding wetlands. This pilot study was conducted in March/April 2002 in an upstream section of the Peconic River designated as "Area A" (Figure 2). This area was selected because it contained a representative backwater area with unconsolidated sediments and vegetation, in addition to a preexisting access road.<sup>20</sup>

The results of this pilot study were compiled in a BNL report entitled, *Completion Report, Operable Unit V Peconic River, Sediment Removal High Capacity Vacuum/Guzzler Recovery Pilot Study, December 11, 2002.* This report indicates that the pilot study met with mixed success. The high capacity vacuum/guzzler was able to meet the cleanup target levels established for the study in only one of three designated sub-areas (Area A-1).<sup>21</sup> In fact, the report states that "...maximum values for mercury, copper, silver, and Aroclor-1254 were greater at A-2/A-3 during post-excavation sampling than those values reported for the pre-pilot sampling."<sup>22</sup>

### ***Sediment Removal/Wetland Restoration***

The sediment removal/wetland restoration technology uses standard construction equipment (e.g., long arm excavators, off-road dump trucks, etc.) followed by wetland restoration to replace wetland functions or adjacent biotic communities eliminated during the remediation process.<sup>23</sup> This was the preferred technology proposed in DOE's February 2000 PRAP.

---

<sup>19</sup> *Completion Report, Operable Unit V, Sediment Removal High Capacity Vacuum/Guzzler Recovery Pilot Study*, Brookhaven National Laboratory, December 11, 2002, p. 3.

<sup>20</sup> *ibid*, p. 2.

<sup>21</sup> *ibid*, p.14.

<sup>22</sup> *ibid*, p. 15.

<sup>23</sup> *Completion Report, Operable Unit V, Sediment Removal and Wetland Restoration Pilot Study*, Brookhaven National Laboratory, December 31, 2002, p. 3

The DOE determined that it would be prudent for BNL to perform a pilot test in order to demonstrate the potential effectiveness of this technology in successfully removing contaminated sediments and restoring the disturbed wetlands.

Figure 2 – Pilot Study Locations



#### Pilot Study - Sediment Removal/Wetland Restoration

In March/April of 2002, BNL conducted a pilot study for the sediment removal/wetland restoration technology in an upstream section of the Peconic River designated “Area D” (Figure 2). This area was selected based on the following criteria: located on BNL property, relatively



accessible for equipment, and easily viewable by the public during remediation and restoration activities.<sup>24</sup>

The results of this pilot study were compiled in a BNL report entitled, *Completion Report, Operable Unit V, Sediment Removal and Wetland Restoration Pilot Study, December 31, 2002*. This report concludes that the pilot study was successful in demonstrating the use of standard construction equipment as an effective technology for sediment removal in a sensitive wetland environment. Additionally, the report states that the subsequent wetland restoration was also successful and created an open water channel shoreline vegetated with native plants in an area that was previously dominated by an invasive grass species.<sup>25</sup>

### **Economically and Environmentally Viable Cleanup Alternatives** **SCDHS/COC Determination**

The SCDHS believes that the initiatives employed by the DOE (e.g., hosting the Peconic River Remedial Alternatives Workshop, evaluating and screening several alternative remediation technologies) were appropriate and thorough. With consideration to the opinions provided by the panel of experts established by the Commissioner (Appendix B), and the information obtained through the DOE initiatives described above, the SCDHS has determined that the most economically and environmentally viable cleanup alternative for the Peconic River is sediment removal using conventional construction equipment, followed by wetland restoration. Some important factors considered in this determination are as follows:

- The SCDHS and COC concur with the DOE conclusion that the extremely long timeframe calculated for the removal of contaminants from the Peconic River by phytoextraction technology (hundreds to thousands of years) renders the use of this alternative technology implausible. The two expert panel members that provided reviews on the BNL phytoextraction report entitled *Determination of Phytoextraction and Harvesting Efficiency of Several Dominant Emergent Wetland Plants – Contaminated Sediment in the Peconic River* (BNL, 2003) also concurred with this DOE finding.<sup>26,27</sup>
- The SCDHS and COC concur with the DOE determination that electrochemical remediation is not a viable remediation alternative for the Peconic River cleanup project. The possibility of this technology concentrating and then mobilizing <sup>137</sup>Cs in the sediment was a serious concern.
- The high capacity vacuum/guzzler pilot study revealed severe limitations in the viability for use of this technology in the Peconic River cleanup. In particular, the inability to meet the cleanup goal objectives in two of three remediated sub-areas was unsatisfactory. In addition, finding post-remediation contaminant concentrations higher than pre-

---

<sup>24</sup> *ibid*, p. 2

<sup>25</sup> *ibid*, p. 27.

<sup>26</sup> Ari Ferro (Phytokinetics, Inc.), in reference to the BNL phytoextraction report states that “As a preliminary screening study, I agree with the conclusion, and I believe that the study used adequate technical methods.”, correspondence Ferro to Rapiejko, July 25, 2003. (Appendix B-1)

<sup>27</sup> David Tompkins (The Chazen Companies), in reference to the BNL phytoextraction report states that “In general, we find the conclusions of the report to be sound.”, correspondence Tompkins to Rapiejko, *Review of Pilot Study Report for Determination of Phytoextraction and Harvesting Efficiency of Several Dominant Wetland Plants*, July 24, 2003. (Appendix B-3)

remediation concentrations in some areas was disconcerting. In the current May 2004 PRAP for the Peconic River, the DOE has included the pilot study sub-areas A-2 and A-3 for re-remediation with standard construction equipment and wetland restoration. With these factors considered, the SCDHS and COC determined that high capacity vacuum/guzzler technology is not viable for the Peconic River cleanup.

The SCDHS and COC have the following specific recommendations regarding the implementation of sediment removal/wetland restoration technology in the Peconic River:

#### Sediment Removal

- A high number of post-remediation confirmatory samples should be collected in order to demonstrate conformance with clean-up objectives.<sup>28</sup>
- Strict engineering controls need to be in place prior to the commencement of excavation to ensure contaminated sediments are not mobilized to areas of the river not targeted for remediation. This is particularly true in the areas of Suffolk County parkland targeted for remediation that are located downstream of the BNL sediment trap.
- A rigorous water column sampling regime downstream of excavation activities needs to be implemented to ensure that mobilization of potentially contaminated sediments is not occurring. These analyses and assessments should have a quick a turn-around time so that needed actions can be conducted in a reasonable time frame. This is particularly true in the areas of Suffolk County parkland targeted for remediation that are located downstream of the BNL sediment trap.

#### Wetland Restoration

- Restoration should be performed with the minimal use of topsoil to avoid the introduction of excess nutrients and weed seeds.<sup>29</sup>
- To the greatest extent possible, plants with local native genotypes should be used for re-vegetating the wetlands.<sup>30</sup>
- Post construction restoration monitoring should include late spring/early summer observations, as well as late summer/early fall observations.<sup>31</sup>
- Post construction restoration monitoring should include an assessment of the wildlife utilization of the mitigation site.<sup>32</sup>
- A long-term assessment of the re-established wetlands should be performed.<sup>33</sup>

<sup>28</sup> The Chazen Companies, correspondence Tompkins to Rapiejko, *Review of Sediment Removal and Wetland Restoration Pilot Study*, July 24, 2003, p.1, (Appendix B-2)

<sup>29</sup> Cornell Cooperative Extension, correspondence Pickerell to Rapiejko, *Suffolk County Department of Health Services (SCDHS) Peconic River Project-Expert Panel*, June 7, 2004 (Appendix B-3).

<sup>30</sup> *ibid*

<sup>31</sup> *ibid*

<sup>32</sup> The Chazen Companies, correspondence Tompkins to Rapiejko, *Review of Sediment Removal and Wetland Restoration Pilot Study*, July 24, 2003, p. 2, (Appendix B-2)

<sup>33</sup> *ibid*

## **V – Comparison of the February 2000 Proposed Peconic River Cleanup Plan and the May 2004 Proposed Peconic River Cleanup Plan**

Resolution 615-2000 was authorized by the Suffolk County Legislature in July of 2000 due to concerns raised at a public hearing regarding the DOE's February 2000 proposed cleanup plan for the Peconic River. Concurrent with this resolution's authorization, the DOE decided to defer the cleanup decision on the Peconic River in order to assess alternative technologies and obtain more information on the extent of contamination in the Peconic River. Having completed these assessments, in May of 2004 the DOE released for public comment a revised cleanup plan for the Peconic River. Since Resolution 615-2000 was authorized because of concerns regarding the adequacy of the now withdrawn Peconic River cleanup plan, a brief discussion on the comparison of the DOE's February 2000 plan and May 2004 is appropriate.

### **February 2000 Cleanup Proposal for the Peconic River**

The DOE's February 2000 proposed remedy for the Peconic River involved the excavation of sediments (using conventional earthmoving equipment) that contained concentrations of contaminants exceeding specified cleanup trigger numbers (9.8 ppm mercury, 88.9 ppm silver, 310 ppm copper). The proposed cleanup trigger numbers resulted in the majority of remediation being conducted on BNL property, with a small area of Suffolk County parkland remediated (Figure 3). The PRAP did not discuss whether wetland restoration would be conducted or not.

The basis for this cleanup proposal was that "...contamination in sediments located in the depositional areas of the on-site Peconic River headwaters pose an ecological concern." The cost for the implementation of this proposal was \$5,947,926.

### **May 2004 Cleanup Proposal for the Peconic River**

The DOE's May 2004 proposed remedy for the Peconic River involves the excavation of the sediment layer (using conventional earthmoving equipment) located in depositional areas, localized "hot spots" and areas identified as preferential methylmercury sources. The proposed remediation includes extensive areas located both on and off BNL property, and includes an area located in Suffolk County parkland five miles downstream from the BNL STP (Figure 4).

The basis for the 2004 cleanup is the human health and ecological concern with respect to elevated PCB (on-site) and mercury (on site/off-site) concentrations in fish. A primary focus of the proposed cleanup action is to reduce bioaccumulation of contaminants in fish, particularly in areas where people may catch and eat fish. The cost for the implementation of this proposal is \$11,461,000.

Figure 3  
Proposed Cleanup Areas – February 2000

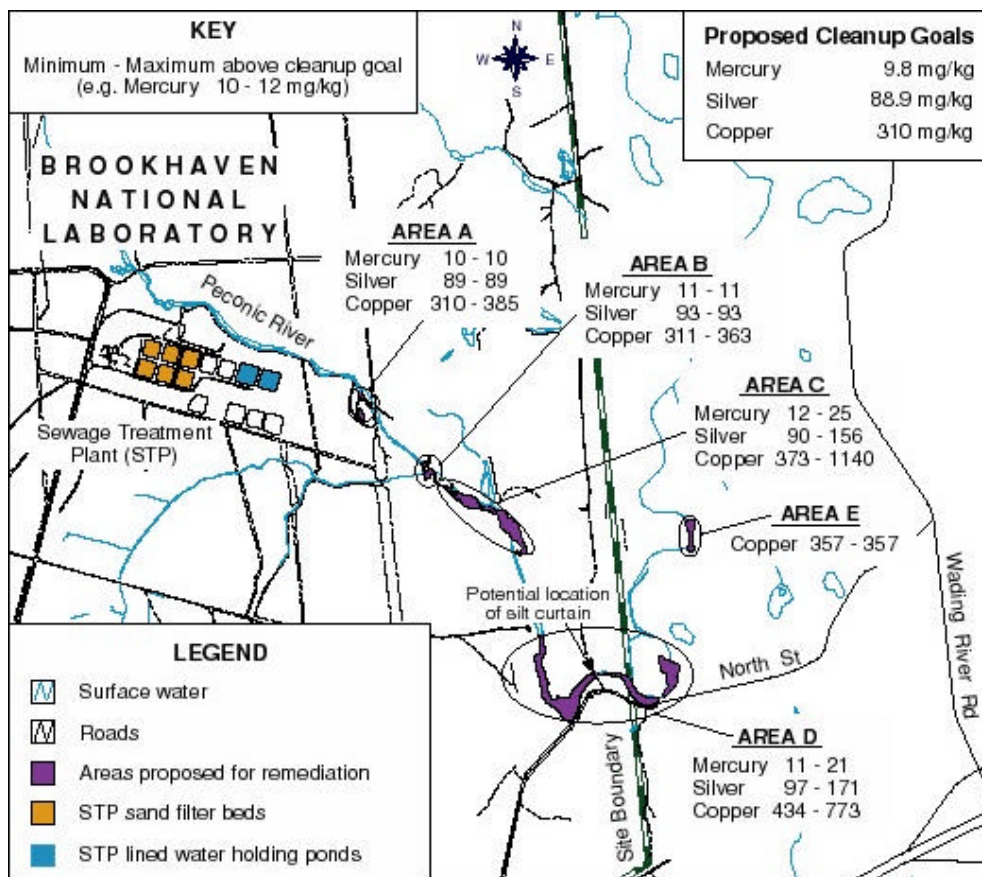
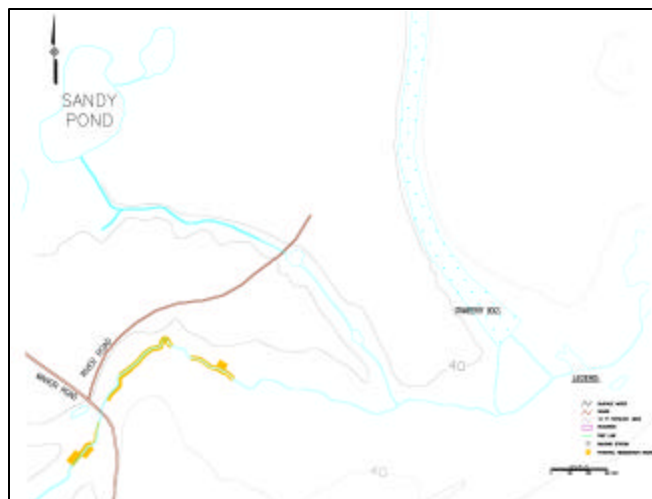
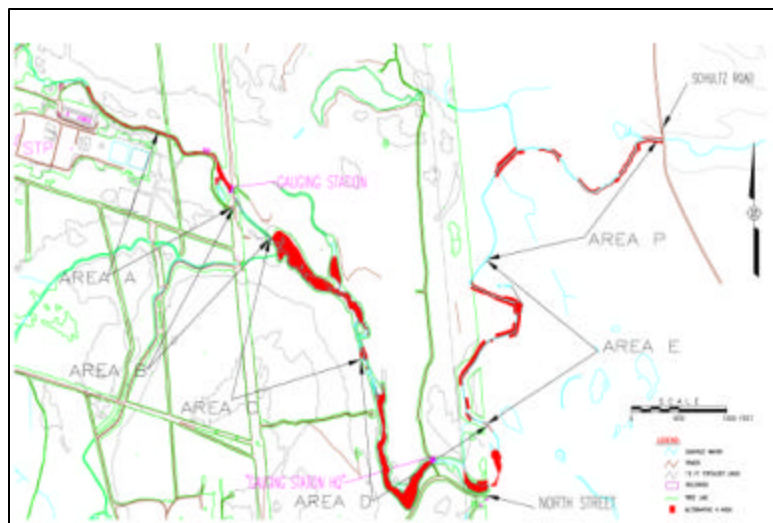


Figure 4  
Proposed Cleanup Areas – May 2004

From BNL STP to Schultz Rd

Near Manor Rd.



### **Comparison of February 2000 and May 2004 Cleanup Proposals for the Peconic River**

The DOE's current Peconic River cleanup plan (May 2004) is a more thorough and appropriate cleanup plan compared to the February 2000 plan. The extent of cleanup currently proposed is approximately three times that proposed in 2000, and the cost approximately two times (Table 7).

The current plan recognizes the human health and ecological concerns regarding the bioaccumulation of contaminants in Peconic River fish, and appropriately has the mitigation of these concerns as a basis for the cleanup. It includes areas now identified within Suffolk County parkland as preferentially producing methylmercury. These areas would not have been remediated in the February 2000 cleanup plan.

Based upon these observations, the SCDHS and COC have determined that, with respect to the extent of cleanup proposed, the May 2004 DOE cleanup plan for the Peconic River is a more thorough and appropriate plan compared to the February 2000 proposal. Additionally, with consideration to the SCDHS/COC determinations made in Section IV of this report (*Determination of Economically and Environmentally Viable Cleanup Alternatives*), the preferred cleanup alternative in the 2004 proposal (sediment removal by standard construction equipment followed by wetland restoration) is appropriate.

Table 7  
Comparison of 2000 and 2004 Peconic River Cleanup Plan

<b>Cleanup Proposal Aspect</b>	<b>February 2000 Peconic River PRAP Preferred Alternative</b>	<b>May 2004 Peconic River PRAP Preferred Alternative</b>
<b>Area of Cleanup</b>	<b>6.86 acres</b>	<b>19.8 acres</b>
<b>Linear extent of river remediation</b>	<b>6,500</b>	<b>14,720</b>
<b>Volume of sediment removed</b>	<b>8,300 cubic yards</b>	<b>24,018 cubic yards</b>
<b>Cost</b>	<b>\$5,947,926</b>	<b>\$11,461,000</b>

## **VI – Conclusions**

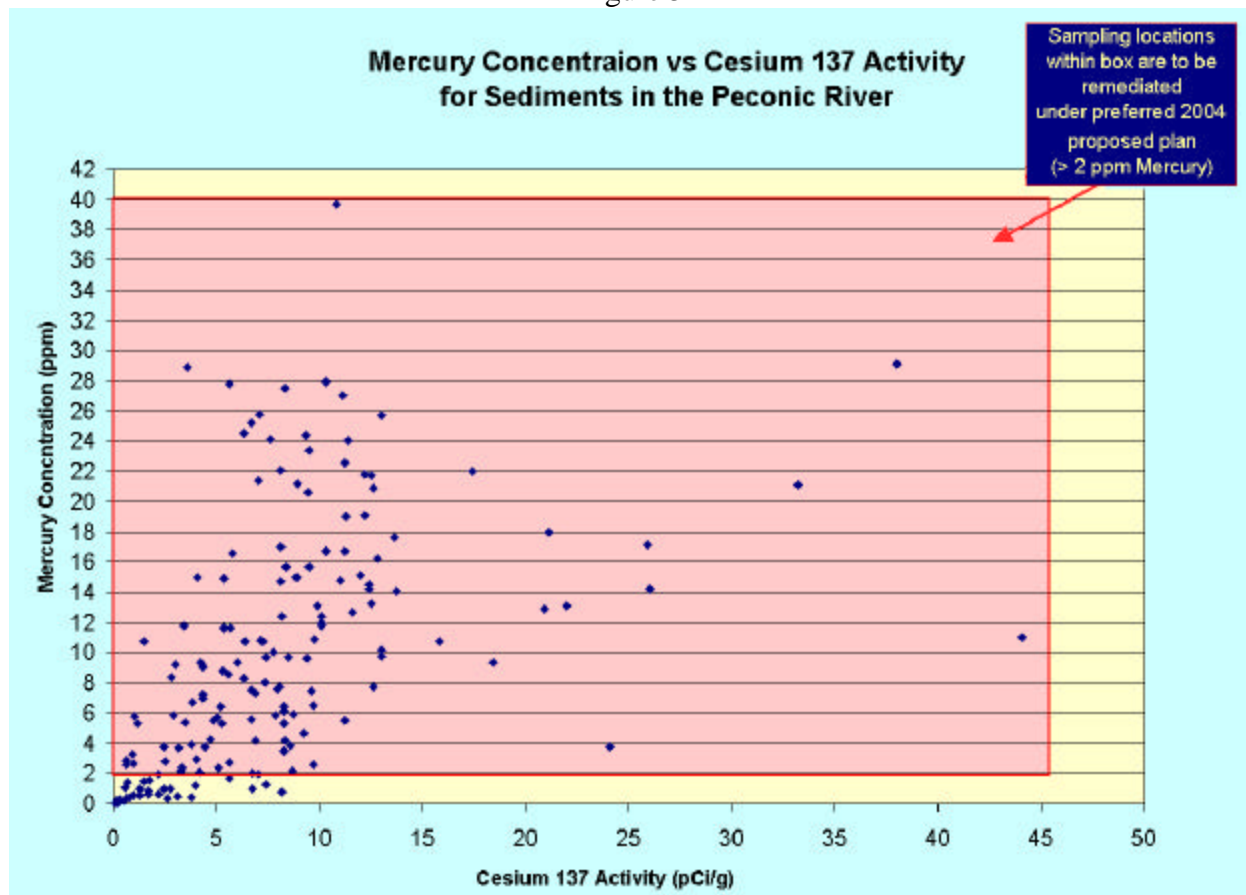
In accordance with Suffolk County Resolution 615-2000, the SCDHS and COC have analyzed the current DOE proposed Peconic River cleanup plan, and considered the input provided by the expert panel established by the Commissioner. The SCDHS and COC have determined that the extent of cleanup necessary is that which reduces, to the greatest extent possible, the identified potential human health and ecological risks caused by the contamination. This requires that sediments in depositional areas containing the highest mercury and PCB contaminant concentrations be remediated. In addition, areas identified as “hot spots”, as well as areas identified as preferentially producing methylmercury, should also be remediated. Targeting areas with the highest mercury and PCB contamination will also assure that the highest levels of other contaminants will also be removed, such as Cs<sup>137</sup> (Figure 5).



The SCDHS and COC have also analyzed economically and environmentally viable cleanup alternatives for the Peconic River cleanup, and considered the input provided by the expert panel established by the Commissioner. The SCDHS and COC have determined that the most economically and environmentally viable cleanup alternative for the Peconic River is sediment removal using conventional construction equipment, followed by wetland restoration.

Upon performing a comparison of the DOE cleanup plan for the Peconic River originally proposed in February of 2000, and the current proposed DOE plan (May 2004), the SCDHS and COC have determined that, with respect to the extent of cleanup proposed, the May 2004 DOE cleanup plan for the Peconic River is a more thorough and appropriate plan compared to the February 2000 plan. Also, the preferred cleanup alternative (sediment removal by standard construction equipment followed by wetland restoration) is appropriate.

Figure 5



## VII– Recommendations

The SCDHS and COC recommend that the DOE implement Alternative 4 in its current Peconic River PRAP. The SCDHS and COC have the following specific recommendations concerning this implementation:

- The results of the current methylmercury sampling effort should be used to determine if additional areas, located outside the identified hot spots east of Schultz Rd., need to be remediated.
- BNL should consider and follow-up with recommendations made by the USGS concerning collection procedures for methylmercury sampling in the Peconic River.
- A high number of post-remediation confirmatory samples should be collected in order to demonstrate conformance with clean-up objectives.
- Strict engineering controls need to be in place prior to the commencement of excavation to ensure contaminated sediments are not mobilized to areas of the river not targeted for remediation. Additionally, a rigorous water column sampling regime (with a quick turn-around time) downstream of excavation activities needs to be implemented to ensure that mobilization of potentially contaminated sediments is not occurring.
- Restoration should be performed with the minimal use of topsoil, and should use plants with local native genotypes for re-vegetating the wetlands, where possible.
- Post construction restoration monitoring should consist of a long-term effort, with late spring/early summer and late summer/early fall observations.
- Post construction restoration monitoring should include an assessment of the wildlife utilization of the mitigation site.
- A long term monitoring program to assess mercury and PCB levels in Peconic River fish should be implemented to assure the mitigation strategies are effective.
- The DOE should continue recent efforts emphasizing the need for environmental stewardship. A permanent display somewhere on-site (e.g., the Science Museum) should be considered to depict the tremendous efforts made in cleaning up the Peconic River contamination that resulted from past poor management practices.